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BIOLOGICAL EVALUATION

FOMES ANNOSUS ROOT ROT IN A PONDEROSA PINE-JEFFREY PINE PLANTATION FREMONT NATIONAL FOREST, OREGON

U.S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
Division of Timber Management
Region 6
Portland, Oregon

February 1974

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INTRODUCTION

Fomes annosus (Fr.) Cke. incites one of the most serious root diseases in the northern hemisphere, causing mortality of conifers, including ponderosa pine, *Pinus ponderosa*, and Jeffrey pine, *P. jeffreyi* (Olson, 1941; Bega and Smith, 1966). The potential for increased losses to this disease in the future is great as management activities in the form of thinnings and harvest cuttings increase in pine stands in the Pacific Northwest.

Freshly cut stump surfaces provide suitable infection courts for windborne spores of the fungus. After colonization and invasion of the stumps, the fungus mycelium grows through the roots and by root contact infects adjacent healthy trees (Cobb and Barber, 1968). Disease centers appear circular in outline as the fungus spreads outward from stumps. Typical damage caused by this fungus in ponderosa pine-Jeffrey pine is illustrated in Figures 1 and 2. Infected trees are easily recognized by the presence of small, pustule-like fruit bodies under the duff at the base of the tree (Figure 3) (Mook and Eno, 1961), by resinosis (Figure 4) and pitch-infiltrated wood under the bark (Figure 5).

OBJECTIVES

During August 1973, pathologists from the Regional Office made a functional assistance trip to the Fremont National Forest to examine pine stands infected by *F. annosus* (Hadfield, 1973). Subsequently, additional assistance was provided to the Silver Lake Ranger District, Fremont N.F. in evaluating the impact of annosus root rot on a plantation during October 1973.

This report is the first of a series designed to provide District personnel with information on the rate of spread and impact of the fungus in a ponderosa-Jeffrey pine plantation.

MATERIALS AND METHODS

The Bridge Creek Burn plantation, a 150-acre area infected with *F. annosus* was selected as a study site. This area had been cut over in 1956 after a burn. Some large ponderosa pine had been left throughout the area to serve as seed sources for regeneration. The area was subsequently planted with Jeffrey pine, resulting in a mixed stocking of the two species.

The soil in this area is a sandy loam of basaltic origin with a pH of 6.5 - 7.0 (Whetzel, 1973). Peace (1962) concludes that most severe damage by the fungus occurs on alkaline sites, due in part to the absence of competing saprophytic fungi such as *Trichoderma viride*. No information, however, is available on the rate of spread of *F. annosus* in sites such as found on the Fremont N.F.

Initially a "walk-through" examination of the entire plantation was conducted to locate disease centers. These centers were distinguished by dead and/or dying trees in the immediate vicinity of old stumps (Figure 1 and 2). Ten discrete root rot centers were located and mapped for study. In order to facilitate relocation of the plots for future examinations, the distance and azimuth of each center to a prominent physical feature was recorded. The central stump was painted with a plot number and the dead and affected trees in the immediate area were marked with blue paint. Yellow flagging was attached to trees to aid in relocating the plot (Figure 1 and 2).

The following data were recorded for each dead and affected tree in each disease center: DBH, tree condition, azimuth and distance from central stump. Nearby green trees were also recorded. The year of death of trees was estimated by condition of the tree. Trees with most needles attached, but red in color were recorded as "1973 kills," those trees with some needles attached and/or fine branch tips intact were recorded as "1972 kills," those trees with no needles attached, fine branch tips missing and some bark sloughing were recorded as "1971 kills," those trees with major branches or tops broken and bark sloughing were recorded as "1970 kills." No attempt was made to determine the year of kill prior to 1970, although a number of trees were probably killed and have since disappeared as evidenced by the appearance of the disease centers and the reduced stocking in the vicinity.

To obtain an estimate of area within each infection center, a circle whose radius was equal to the distance of the outermost infected tree from the central stump was circumscribed around each plot. The area within the circle was divided into four quadrants. Each quadrant containing at least one infected or dead tree was used to estimate the area of infection.

RESULTS AND DISCUSSION

A summary of the data recorded for each disease center is presented in Table 1. A total of 31 trees were killed by *F. annosus* in the 10 plots tallied. The DBH of killed trees ranged from less than 1 inch to 3.4 inches (average 1.4 inches). The loss of trees appears to be increasing as the fungus spreads outward from the stumps. This loss expressed as a percent of total dead in 1970, 1971, 1972 and 1973 is 16.7, 26.7, 16.7 and 40.0 percent, respectively.

The outward spread of *F. annosus* from a stump to adjacent trees is illustrated by Plot 6 (Figure 6) which shows that the 1973 kills were farthest (average 21.0 feet) from the stump, while the oldest kills, 1971, were nearest the stump (average 15.9 feet). In this center, *F. annosus* appears to be advancing at an average rate of 1.25 feet per year (assuming the stump was infected in 1956). Plots 8 and 9 had a combined average rate of spread of 1.06 feet per year.

The area within the disease centers varied from 75 to 982 square feet (average 320 sq. ft.). The eventual impact that the disease will have in this plantation is unknown at this time. Revisits at periodic intervals are necessary to determine the fate of the trees adjacent to disease centers.

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Enclosures

TABLE 1 - Summary of individual plot data from *Fomes annosus* disease centers at Bridge Creek Burn Plantation

Plot No.	Central Stump Diam. (inches)	Dead Tree DBH (inches)	Distance from central stump (Feet)	Year of Tree death				Area of infection (sq. ft.)
				73	72	71	70	
1	22.9	2.6	7.5	x				
		2.7	5.0	x				88
2	28.6	2.6	5.3	x				
		< 1	10.5		x			
		< 1	6.5		x			173
3	48.0	< 1	5.5	x				75
4	21.5	< 1	8.2			x		106
5	39.2	2.2	15.7	x				
		< 1	9.6			x		387
6	38.7	1	22.7	x				
		3.4	19.3	(74)				
		1.7	21.3	x				
		< 1	18.6			x		
		1.8	17.1			x		
		< 1	17.2		x			
		2.0	19.1	x				
		< 1	12.3			x		
		< 1	15.6			x		809
7	31.0	< 1	5.8	x				
		< 1	11.6			x		106
8	34.3	< 1	12.1				x	
		< 1	12.9				x	
		1.7	18.1	x				
		< 1	14.2				x	
		< 1	25.7				x	158
9	37 (est.)	< 1	17.4		x			
		< 1	5.9				x	982
10	20.0	1.3	4.3	x				
		1.9	7.8	x				
		< 1	11.5			x		
		< 1	9.4		x			311
TOTAL	321.20	43.90	393.70	13	5	8	5	3195.00
AVE.	32.1	1.4	13.4					319.5

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Figure 1.--Typical *F. annosus* disease center with dead and dying trees in the immediate vicinity of a large stump.

Figure 2.--Recently killed pine with attached foliage and resinosis at the base of the stem.

Figure 3.--Pustule-like fruit bodies of *F. annosus* at the base of an infected tree. Note pitch pocket.

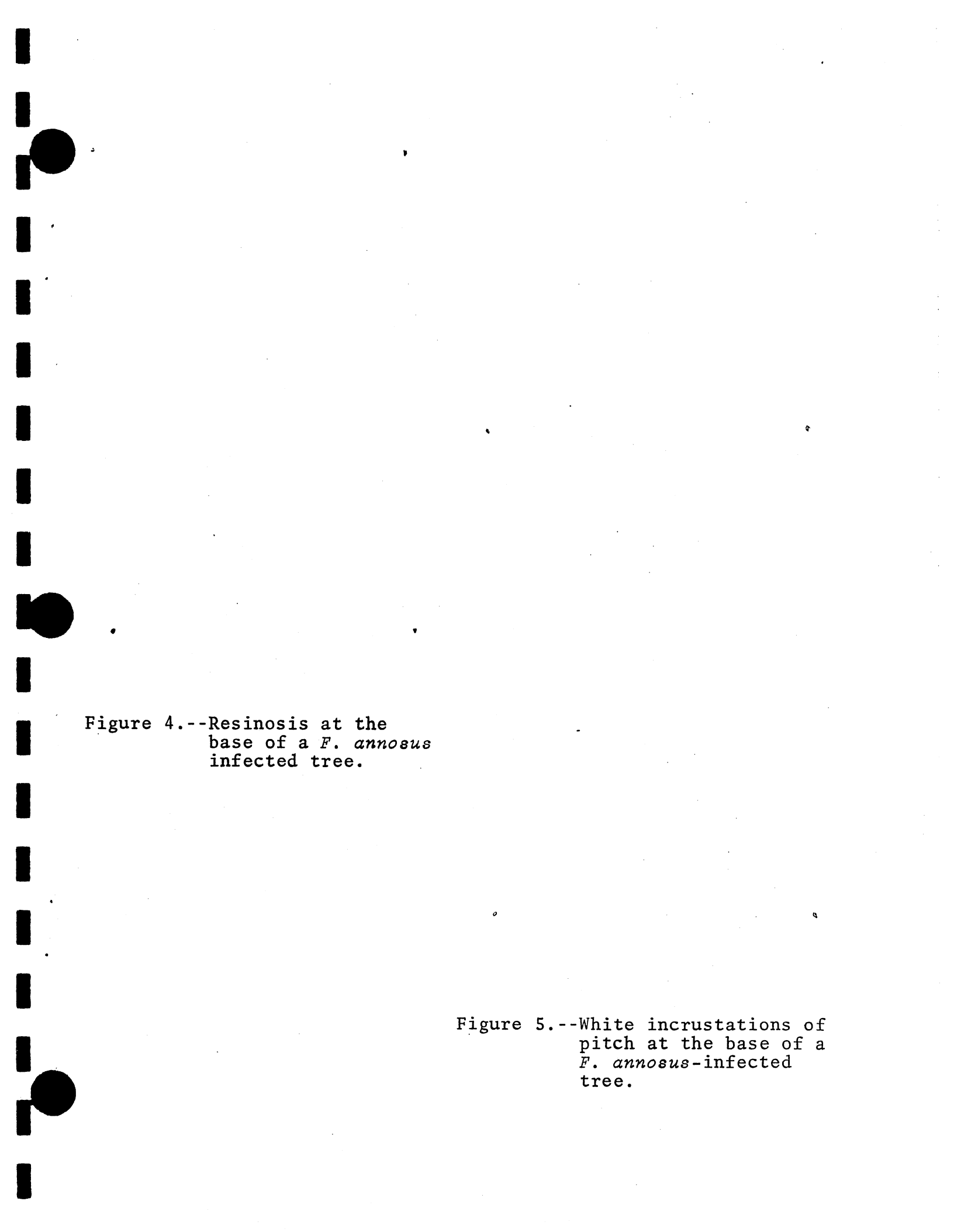
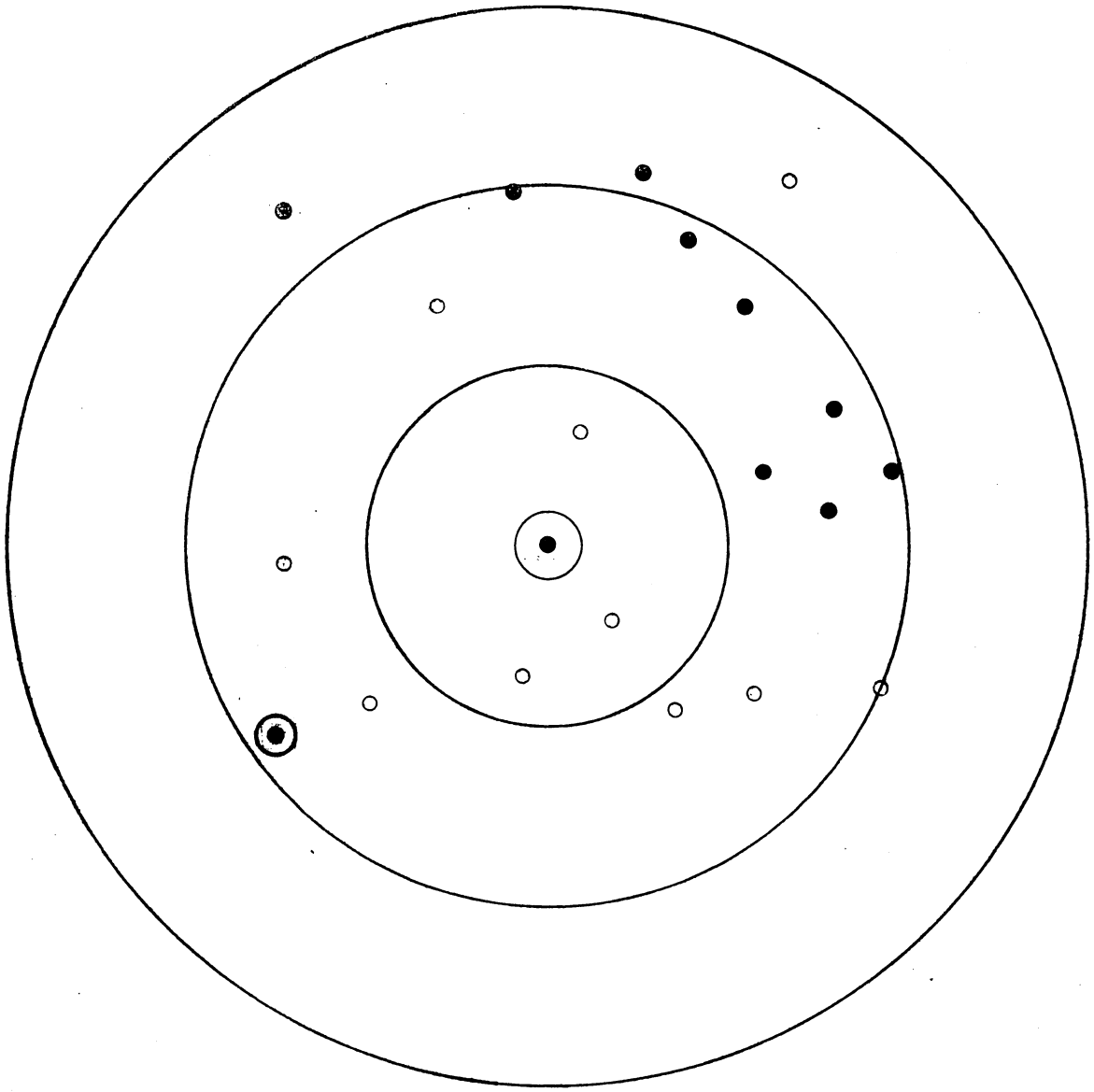


Figure 4.--Resinosis at the base of a *F. annosus* infected tree.

Figure 5.--White incrustations of pitch at the base of a *F. annosus*-infected tree.

Figure 6.--Diagram of typical *Fomes annosus* root rot center in Ponderosa-Jeffrey Pine Plantation on Silver Lake Ranger District, Fremont National Forest



LEGEND

● Dead Trees

○ Live Trees

◉ Stumps from 1956 cutting

SCALE

1" = 10'